

Customer No.: 31561
Application No.: 10/711,509
Docket No.: 12405-US-PA-0P

REMARKS

Present Status of the Application

This is a full and timely response to the outstanding final Office Action mailed on May 9, 2006. The Office Action has also rejected claims 1-2, 4, 10, 19-20, 22, 24 under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (USP 6,222,214) in view of Lee et al (USP 6,737,305) and to claims 3, 5-7, 21, 23, 26-27 under 35 U.S.C. 103(a) as being unpatentable over Wu in view of Lee and further in view of Yang et al. (US Publication 2002/0102781 A1). Upon entry of this response, claims 1-7, 10, 19-24, 26-27 remain pending.

Applicant has most respectfully considered the remarks set forth in this Office Action. Regarding the anticipated rejection, it is however strongly believed that the cited references are deficient to adequately teach the claimed features as recited in the amended claims. The reasons that motivate the above position of the Applicant are discussed in detail hereafter, upon which reconsideration of the claims is most earnestly solicited.

Discussion of Office Action Rejections

Applicants respectfully traverse the rejection of claims 1-2, 4, 8, 10, 19-20, 22, 24-25 under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (USP 6,222,214) in view of Lee et al (USP 6,737,305) because a prima facie case of obviousness has not been established by the Office Action.

Customer No.: 31561
Application No.: 10/711,509
Docket No.: 12405-US-PA-0P

Applicants respectfully traverse the rejection for at least the reasons that not every element of the claim was taught or suggested by Wuu in view of Lee such that the invention as a whole would have been obvious to one of ordinary skill in the art.

Wuu teaches that the channel layer 18' of a P-channel TFT is formed with a relatively thin amorphous silicon layer 18 doped with N-type dopant such as (As) or (P). Wuu further teaches subjecting a portion of the amorphous silicon layer 18 to an ion implantation using a P type dopant to form the source/drain doped regions. In essence, Wuu teaches the source/drain and the channel are formed of a same layer and the source/drain regions are not formed over the channel layer as taught in the instant case.

The Office then relies on Lee to teach the missing feature. Lee basically teaches forming a first a-Si layer 106a, a second a-Si layer 106b, a N+Mixed a-Si layer 106c as the channel layer 106. Although Lee teaches forming a source/drain over both sides of the channel layer 106, it is essential for Wuu to have the source/drain and the channel formed of the same layer in order to provide for the P+/N- junctions between the FET channel and the source/drain areas. Since combining Wuu with Lee's source/drain formed over the channel layer would lead to an inoperative device, the motivation to combine Wuu with Lee is thereby lacking.

Moreover, Wuu fails to teach the step of forming the channel layer comprising "forming a first lightly doped sub-amorphous silicon layer at a first deposition rate and forming a second lightly doped sub-amorphous silicon layer at a second deposition rate". Applicants respectfully disagree with the Office's assertion that Wuu teaches forming "two sub-amorphous layers the second over the first, both parts of 18" and "while Wuu does not

Customer No.: 31561
Application No.: 10/711,509
Docket No.: 12405-US-PA-0P

specify a deposition rate some rate must be associated with the deposition for the LPCVD method". Wuu simply teaches forming a relatively thin amorphous silicon layer to provide a channel layer for the thin film transistors and the silicon layer is achieved by a low temperature CVD. See Col. 5, lines 39-57, Figure 6. There is no where in Wuu that either explicitly discloses or implicitly suggests the formation of the first and the second lightly doped sub-amorphous silicon layers at the first and the second deposition rates, respectively. Applicants believe that the Office is arguing out of hindsight by looking back through Applicants' disclosure and declare claim limitations obvious where such declaration can only be guided by Applicants' disclosure. Applicant respectfully reminds the Office that *"[i]t is impermissible, however, simply to engage in a hindsight reconstruction of the claimed invention using the Applicant's structure as a template and selecting elements from the references to fill the gaps"*. See *In re Gorman*, 933 F. 2d 982, 987, 18 USPQ 2d 1885 (Fed. Cir. 1991).

Similarly with Lee, Lee simply teaches forming a first a-Si layer 106a, a second a-Si layer 106b, a N+Mixed a-Si layer 106c as the channel layer. Accordingly, Lee only teaches one silicon layer 106c being doped, whereas the channel layer of the instant case comprises two lightly doped amorphous silicon layers. It is imperative for the instant case to form a first and a second lightly doped sub-amorphous layers because the effective content ratio of phosphine or boroethane in the process of forming two sub-layers has a positive effect on the turning-on-current and the electron mobility of the channel layer.

Additionally, Wuu teaches at least two gate electrodes 14, and only one of the gate electrodes comprises the source/drain 18 (please refer to Figure 6). The present invention,

Customer No.: 31561
Application No.: 10/711,509
Docket No.: 12405-US-PA-0P

however, teaches each gate comprises a channel and a source/drain. Further, the instant case teaches the source/drain regions covers a portion of the gate, while the channel 18' of Wuu extends beyond the side of the gate electrode (G1) to preclude the source/drain region to cover the portion of the gate.

In summary, the present invention has demonstrated with the proper fabrication conditions for forming the channel layer, and the resulting properties of the channel layer exhibit unexpected desirable results. For example, forming a first lightly doped amorphous silicon layer at a first rate with a first effective content ratio of phosphine or boroethane, followed by forming a second lightly doped amorphous silicon layer at a second rate with a second effective content ratio of phosphine or boroethane would result with a channel layer of higher tuning-on current and electron mobility. As stated *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974), "[t]o establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art". Therefore, even the prior art references are being considered collectively, the fact that neither Wuu nor Lee suggests or teaches forming the channel layer by forming a first light doped sub-amorphous silicon layer at a first rate and a second light doped sub-amorphous silicon layer at a second rate, the combination still fails to render the instant case obvious.

For at least the foregoing reasons, Applicants respectfully submit that independent claims 1 and 19 patently define over Wuu in view of Lee, and should be allowed. Since claims 2, 4, 8, 10, 20, 22, 24-25 are dependent claims, which further define the invention recited in claims 1 and 19, respectively, Applicants respectfully assert that these claims also are in condition for allowance.

Customer No.: 31561
Application No.: 10/711,509
Docket No.: 12405-US-PA-0P

Applicants respectfully traverse the rejection of claims 3, 5-7, 21, 13, 26 and 27 under 103(a) as being unpatentable over Wu in view of Lee and further in view of Yang et al. (US Publication 2002/0102781, hereinafter "Yang") because a prima facie case of obviousness has not been established by the Office Action.

With regard to the 103 rejections of claims by Wu in view of Lee and further in view of Yang, Applicants respectfully submit that these claims defined over the prior art references for at least the reasons discussed above.

Although the Office recognizes that neither Wu, Lee nor Yang specify the concentration of the dopants or the ratio of the reactants, the Office asserts that "a change in temperature, or in concentration or in both, would be an unpatentable modification...". Contrary to the Office's assertion, the specification provides specific examples of the critical nature of the effective content ratio of phosphine or boroethane in the process of forming the channel layer. Figures 3 & 4 illustrate the results of tests in which the turning-on-current and the electron mobility of the channel layer are influenced by the effective content ratio of phosphine in the fabrication of the first lightly doped sub-amorphous layer and the second lightly doped sub-amorphous layer.

For at least the reason the neither Wu, Lee nor Yang teaches the claimed concentration of dopants or the ratio of the reactants as recited in claims 4-7 & 23-24, 26-27, Applicants submit that the rejections to claims 3, 5-7, 21, 13, 26 and 27 have been traversed, rendered moot, and/or accommodated, and that the pending claims 3, 5-7, 21,

Customer No.: 31561
Application No.: 10/711,509
Docket No.: 12405-US-PA-0P

13, 26 and 27 are in condition for allowance. Favorable consideration and allowance of the present application and all pending claims are hereby courteously requested.

Customer No.: 31561
Application No.: 10/711,509
Docket No.: 12405-US-PA-0P

CONCLUSION

For at least the foregoing reasons, it is believed that all the pending claims of the present application patently define over the prior art and are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

Date :

7/25/2006

Respectfully submitted,



Ding Yu Tan

Registration No.: 58, 812

Jianq Chyun Intellectual Property Office
7th Floor-1, No. 100
Roosevelt Road, Section 2
Taipei, 100
Taiwan
Tel: 011-886-2-2369-2800
Fax: 011-886-2-2369-7233
Email: Usa@jicpgroup.com.tw